

Residential Computer Modeling

Draft – Status Report

Overview

A number of changes to the ACM modeling rules are proposed to improve the accuracy of the compliance calculations.

Description

In addition to computer modeling changes that are part of other proposed measures, there are a number of refinements that will be considered for the 2005 standards. Changes are proposed for the treatment of slab edge heat exchange, natural ventilation, thermostat settings and the glazing obstruction factor.

Benefits

The proposed modeling changes will improve the accuracy of the compliance calculations to properly value the demand and energy savings of energy efficiency features. This is especially important with the potential inclusion of the time dependant valuation (TDV) methodology that depends on the accurate modeling of loads at any given hour.

Type of Change

These changes would primarily be documented in the ACM manual, with some minor changes to the *Residential Manual* and compliance forms as well. These changes will not alter the input to or output from the ACMs and will be invisible to the compliance user. The ACM modifications are minor, ranging from changes to fixed inputs to addition of a simple algorithm or table.

Cost Effectiveness

As these are modeling issues, there is no direct cost. However, these modeling changes can affect the cost effectiveness of energy efficiency measures as estimates of energy use will change.

Analysis Tools

The modeling details in computer performance calculations affect all aspects of the standards development process. These modeling changes will be incorporated into the computer performance method early in the process so that the revised calculations can be used to evaluate the cost effectiveness of proposed measures. Eventually, all approved software will have to be modified to accommodate these proposed changes.

Relationship to Other Measures

To the extent that making these changes will modify the estimated heating and cooling energy, it will have an impact on the value of compliance measures. For example, changing the natural ventilation model will likely decrease the amount of cooling attributed to ventilation. This will increase the amount of mechanical cooling needed, making measures like low solar gain glass and higher air conditioner efficiency more attractive compliance features.

Recommendations

1. **Slab Edge.** Current ACM rules use the outdoor temperature for the current hour when calculating the heat exchange at the slab edge. This overstates the heat loss in the heating months and the heat gain during the cooling months, especially during peak cooling conditions. The proposed change is to use the ground temperature model from DOE2. This model uses a mathematical approximation for monthly ground temperature, which lags the mean outdoor temperature and has a reduced annual variation due to the mass effects of the ground. Either the algorithm or a table of monthly ground temperatures by climate zone will be used to specify the appropriate temperatures in the ACM. This change will not alter the input or output for the ACM and will be invisible to the compliance user.
2. **Natural Ventilation.** Current ACM rules open a fraction (default is 10%) of the window area whenever it is above the desired temperature indoors and useful cooling is available by opening the windows. Concerns have been expressed that this provides more ventilation that is appropriate especially when windows are kept closed for security reasons. This understates the cooling energy that would otherwise be used to keep the home comfortable. The proposed change is to revise the assumptions for operation of the windows to reduce natural ventilation. This change will not alter the input or output for the ACM and will be invisible to the compliance user.
3. **Thermostat Settings.** Current ACM rules use a constant cooling setpoint of 78F and a setback schedule for heating of 68F during the day and evening and 60F from 11pm to 8am. Field research on thermostat operation practices indicates that this is not always the case. For example, some fraction of the homes have the systems off while occupants are at work, and thermostats are not uniformly setback to the extent currently assumed. There is no specific proposal at this time, but this is an ACM assumption that must be resolved before LCC analysis can be completed. This change will not alter the input or output for the ACM and will be invisible to the compliance user.
4. **Glazing Obstruction Factor.** Current ACM rules specify a glazing obstruction factor of 0.675. This factor scales the solar gain on windows to better account for dust and measured data that indicates that there is less solar heat gain in buildings than the calculated estimates due to factors like site conditions that include trees, fencing and adjacent buildings. There is no specific proposal at this time, but this value may need to be adjusted to balance other ACM modeling changes. This change will not alter the input or output for the ACM and will be invisible to the compliance user.